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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10,002,714	11.01.2001	George S. Bokisa	MCGEPO178USA	3098

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EXAMINER

PATEL, ISHWARBHAI B

ART UNIT PAPER NUMBER

2827

DATE MAILED: 06/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/002,714

Applicant(s)

BOKISA ET AL.

Examiner

Ishwar (I. B.) Patel

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 February 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. Newly added drawing was received on February 6, 2003. These drawing is objected to because the figure is improperly cross hatched. All the parts shown in section , and only those parts must be cross hatched. The cross hatching pattern should be selected from those shown on page 600-114/115 of the MPEP based on the material of the part. See also 37 CFR 1.84(h)(3) and MPEP 608.02.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakayama et al., US Patent No. 4,935,312, hereafter Nakayama, in view of Tanimoto et al., US Patent No. 6,110,608, hereafter Tanimoto.

Regarding claims 1, 22, 25 and 26 Nakayama discloses a printed circuit board comprising:

electrical circuitry formed on an outer surface of the printed circuit board, the circuitry comprising copper or a copper alloy (copper foil 6 on polyimide film 7 etched to provide film carrier, see figure 2, column 7, line 1-15);

A final finish on the circuitry, the final finish comprising a coating of tin on the copper or copper alloy circuitry (tin plating 8, see figure 2, column 7, line 1-15); and a cap layer on the tin coating (layer 9, see figure 2, column 7, line 1-15), but

Fail to disclose the cap layer made of an alloy comprising at least two immersion platable metals. The cap layer of Nakayama is of Indium.

However, the alloy cap layer of two immersion platable metals is known in the art for better solderability. Tanimoto disclose such alloy cap layer, see Tanimoto, column 5, line 5-10 and column 4, line 23, a multiple alloy of Sn-In-Ag alloy, a Sn-Zn-In alloy and a Sn-Bi-Ag-Cu alloy, in addition to two element alloy such as Sn-Ag alloy, a Sn-Bi alloy, Sn-Cu alloy, a Sn-In alloy and Sn-Zn alloy, and, though not disclosed explicitly, Sn, Zn, Cu and Ag are immersion platable.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the circuit board on Nakayama with alloy cap layer on tin coating layer as taught by Tanimoto in order to have a circuit board with excellent solderability.

Regarding the process limitation in claims 22, 25 and 26, the process limitation defines the claimed invention over the prior art to the degree that it defines the product itself. A process limitation cannot serve to patentably distinguish the product over the prior art, in the case that the product is the same as, or obvious over, the prior art. See Product-by-Process in MPEP 2113 and 2173.05(p) and *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985).

Regarding claims 2, 3, 4, 23 and 24 the combination of Nakayama and Tanimoto further discloses the immersion platable metals as Sn-Ag-Cu alloy, see Tanimoto, column 5, line 5-20, and column 4, line 23, a multiple alloy of Sn-In-Ag alloy, a Sn-Zn-In alloy and a Sn-Bi-Ag-Cu alloy, in addition to two element alloy such as Sn-Ag alloy, a Sn-Bi alloy, Sn-Cu alloy, a Sn-In alloy and Sn-Zn alloy.

Regarding claim 12, the combination of Nakayama and Tanimoto discloses all the features claimed invention including one immersion platable metal other than tin as applied to claim 1-4 above.

Regarding claims 13 and 16, the combination of Nakayama and Tanimoto discloses all the features claimed invention including the alloy cap metal as applied to claim 2-4 above.

Regarding claim 14-15 and 17-18, the applicant is claiming the proportion of tin and silver in the alloy cap layer, 50 wt% to about 98wt% tin as claimed in claim 14 and 17, 80 wt% to about 95wt% tin as claimed in claim 15 and 18. However the percentage of tin or silver will be adjusted upon the combination of other alloying materials in the composition to get better solderability and desired melting temperature.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the circuit board of combination of Nakayama and Tanimoto with tin and silver percentage as claimed in claims 14, 15, 17 and 18, in order to have better solderability and desired melting temperature.

Regarding claims 5 and 6, the combination of Nakayama and Tanimoto further discloses the tin layer from 0.5 μm to 15 μm , see Nakayama column 5, line 30-40 and Tanimoto column 5, line 34-40, which cover both ranges as claimed.

Regarding claims 7 and 8, the combination of Nakayama and Tanimoto discloses the alloy cap layer from 0.5 μm to 5 μm , though Tanimoto further discloses that the thickness less than 0.5 μm or greater than 5 μm , can be provided but will not give any additional advantages, see Tanimoto column 5, line 47-60.

Regarding claims 9, 19 and 27, the combination of Nakayama and Tanimoto further discloses the circuitry remains free of tin whiskers, (Tanimoto column 9, line 15-25).

Regarding claims 10, 11, 20, 21, 28 and 29, the applicant is claiming the circuit board free of tin whisker for atleast 70 hours at 130 ° C as claimed in claim 10,20 and 28 and the circuit board remains solderable for at least one year as claimed in claims 11, 21 and 29.

Though the combination of Nakayama and Tanimoto does not explicitly disclose the specific duration for the board to remain whisker free and solderable, the crux of the invention is to make a circuit board to remain whisker free and solderable for a longer period without any deterioration.

Response to Arguments

4. Applicant's arguments filed February 6, 2003 have been fully considered but they are not persuasive.

(a) Argument: No motivation to combine the art.

Nakayama, in the background discussion discloses problem of whisker in using tin or tin alloy and find a different solution using Indium, however, the later prior art of Tanimoto et al. successfully discloses the use of Tin and Tin alloy as an alternate to using Pb (lead) base material, which has a problem of pollution, for providing the surfaces with better solderability and whisker free.

While motivation for the combining is not expressly disclosed, the test for combining reference is what the combination of disclosures taken as whole would suggest to one of ordinary skill in the art.

In the instant case, though Nakayama, in the background discussion discloses that tin base alloy is a good alternative to the lead (Pb) base alloy, but has a problem of tin whisker. Tanimoto discloses using tin alloy without such problem, and one of ordinary skill in the art would be motivated to use the new knowledge to combine with the old art.

(b) Claims 1, 12, 22, 25 and 26: Applicant argues that Tanimoto fails to teach or suggest immersion plating of any metal. Tanimoto discloses the tin alloy material as claimed and as such the structure of combination of Nakayama and Tanimoto discloses the structure as claimed.

Though, the combination of Nakayama and Tanimoto does not disclose immersion plating, these are structural claims and as applied to claim 22, 25 and 26, the process limitation defines the claimed invention over the prior art to the degree that it defines the product itself. A process limitation cannot serve to patentably distinguish the product over the prior art, in the case that the product is the same as, or obvious over, the prior art. See Product-by-Process in MPEP 2113 and 2173.05(p) and *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985).

Further, claims 1-20, does not claim immersion plating. Claims 22-29, claim immersion plating, exclusively, as a method step, showing how the coating is provided.

(c) Claims 10, 11, 20, 21, 28 and 29. Applicant's argues that the combination of Nakayama and Tanimoto does not disclose the features of circuitry surface remain whisker free and solderable. The invention of Tanimoto is to provide a Pb free solder

with better solderability and without development of whisker, back ground discussion of Tanimoto, column 1. line 63-65 and column 9, line 21-23.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Melton et al., discloses immersion plating tin-bismuth alloy containing 50% to 70% tin.

Ferrier et al., discloses immersion silver plating.

Mandich et al., discloses electroless silver-plating composition.

Soutar et al., discloses immersion plating composition consisting silver, tin, bismuth, nickel, lead, palladium, cobalt, gold, platinum and combination thereof.

Davis discloses electroless tin and tin-lead alloy bath.

Kosuga et al., discloses Sn-Bi, Sn-In solder alloy coating.

Vitale et al., discloses spray displacement tin-plating process.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ishwar (I. B.) Patel whose telephone number is (703) 305 2617. The examiner can normally be reached on M-F (8:30 - 5).

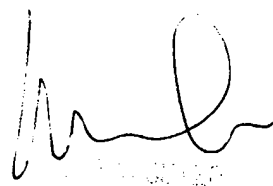
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L Talbott can be reached on (703) 305 9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305 3431 for regular communications and (703) 305 7724 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308 0956.

ibp
May 21, 2003



Handwritten signature of the examiner, with a faint, illegible stamp below it.